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Method article

Treatment of sugar processing industry effluent up to remittance limits: Suitability of hybrid electrode for electrochemical reactor

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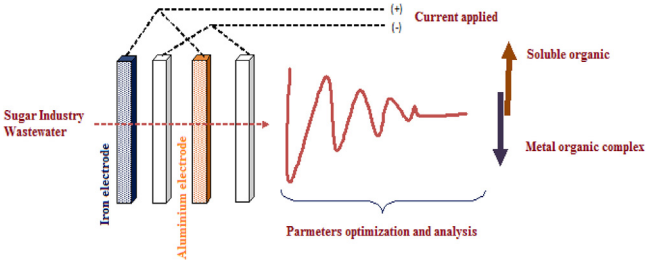
GRAPHICAL ABSTRACT



ABSTRACT

Sugar industry is an oldest accommodates industry in the world. It required and discharges a large amount of water for processing. Removal of chemical oxygen demand and color through the electrochemical process including hybrid iron and aluminum electrode was examined for the treatment of cane-based sugar industry wastewater. Most favorable condition at pH 6.5, inter-electrode gap 20 mm, current density 156 A m^{-2}, electrolyte concentration 0.5 M and reaction time 120 min, 90% COD and 93.5% color removal was achieved. The sludge generated after treatment has less organic contain, which can be used as manure in agricultural crops. Overall the electrocoagulation was found to be reliable, efficient and economically fit to treat the sugar industry wastewater.

- Electrocoagulation method for sugar processing industry wastewater treatment Optimization of operating parameters for maximum efficiency.
- Physicochemical analysis of sludge and scum.
- Significance of hydride metal electrode for pollutant removal.

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Method details

Overview

Electrocoagulation is advance technique being employed in the treatment of water and watewater [1]. This methds offer an alternative to the use of metal salts or polymers and polyelectrolyte addition for breaking stable emulsions and suspensions. The destabilization mechanism occurred, in compression of double layer; charge neturalization and flock formation [2,3]. In considering being several technology electrocoagulation treatments is adequate and survivable one. Electrochemical treatment also showed better achievements for removal of suspended colloidal from water and wastewater as compared to classical coagulation treatment process [4]. Different combinations of the parameter are responsible for performance electrochemical process; in one of them is electrode material. The suitable electrode material like iron [5], aluminum [6] and other metals like carbon, mild steel, and stainless steel [7], including combination of iron and aluminium [8] are used for treatment of different industrial waste water. Electrochemical treatment processes have a simple arrangement and portable for transportation, including convenient to handle.

The sugar industry is coming under prime agro- business. To process one ton of sugarcane large quantity of fresh water required and large amount of wastewater release as wastewater. The effluent generated from sugar processing industry has miscellaneous quality like contains high BOD, COD, grease, dissolved solid etc. To comply with the environmental norms for the release of effluent, generally conventional (settling, filtration and pond treatment) methods were brought in practices for the economical purpose [9]. To minimise the contaminated level from wastewater an attempted has been made with electrocogulation method. In present work, electrochemical methodology has been applied for the treatment of sugar industry wastewater with hydride (iron and aluminum) electrode. The quality of wastewater was controlled by operating parameters of electrochemical reactor and brings up to acceptable norm. The scum and sludge were analyzed by thermal degradation and energy x-ray diffraction methodology.

Methodological protocols

Material

Aluminum (Al-8011) and the iron (SS-302) sheet were purchased from local market. Measure dimension of the sheet was cute with a metal cutter and clean before used. Laboratory grade chemical was used without purification. The waste water preserved in 4 °C deep freeze untilled used and composition of effluent is presented in Table 1.

Experimental methods

The complete experimental is shown in Fig. 1. The manageable electrochemical container was prepared from transparent glass and fitted with a pair of anode and cathode. These electrodes were arranged in parallel and maintained 20 mm space between them. A DC power was supply through electrodes. The current supply and voltage were measured with ammeter and voltmeter. The electrochemical reactor was used for batch and continuous experiments. The configuration of the